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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,940	02/20/2004	Kenneth K. Li	2138-280	9708
6449	7590	02/24/2005	EXAMINER	
ROTHWELL, FIGG, ERNST & MANBECK, P.C. 1425 K STREET, N.W. SUITE 800 WASHINGTON, DC 20005			CARIASO, ALAN B	
			ART UNIT	PAPER NUMBER
			2875	

DATE MAILED: 02/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/781,940

Applicant(s)

LI ET AL.

Examiner

Alan Cariaso

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,7-11,17,19,21,22 and 31-39 is/are rejected.
- 7) ☒ Claim(s) 2-6,12-16,18,20 and 23-30 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 August 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 20041027.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: ____.

DETAILED ACTION

Drawings

1. The drawings were received on August 10, 2004. These drawings are approved in form and quality. However, a new drawing objection in regard to content follows:
2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the shape of the input surface (of the input light pipe) including convex, concave, toroidal, and spherical (claim 8); the shape of the output surface (of the input light guide) including flat, concave, toroidal, and spherical (claim 9); each of the shapes of the input surface and output surface (of the output light pipe) including convex, concave, toroidal, and spherical (claims 13 and 14) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claims 11, 16, 21 and 35 are objected to because of the following informalities:
4. Claims 11 and 16, the acronyms "SLP" and "TLP" are not clear in meaning. They should include their full terminology.
5. Claim 21, line 6, "said input surface" has no preceding reference.
6. Claim 35, the acronyms "LCOS", "DMD" and "LCD" are not clear in meaning. They should include their full terminology.
7. Appropriate correction is required.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 17, 19, 34, 35, 38 and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by IMAI et al (JP 63197913 A).

10. IMAI discloses a polarization recovery apparatus (figs.1 & 3) comprising: a polarizing beam splitter (4) transmitting a light (7) of a useful polarization (9) in an output direction (7,15) and reflecting a light (8) of a non-useful polarization (10) in a first orthogonal direction (8) substantially orthogonal (pg.2, 1st column, line 31) to said output direction (7,15); an initial reflector (5 in fig.1 or 18 in fig.3) disposed reflectably to said first orthogonal direction (8), said initial reflector (5 or 18) reflecting said non-useful polarization light (10) in a second orthogonal direction (11) substantially orthogonal to said output direction (7,15) and said first orthogonal direction (8); a final reflector (6 in fig.1 or 19 in fig.3) disposed reflectably to said second orthogonal direction (11), said final reflector (6 or 19) reflecting said non-useful polarization light (11) in said output direction (15); wherein said non-useful polarization light (10,11) is rotated substantially to light of said useful polarization (12,14 in fig.1 or 23 in fig.3 being the same polarization orientation as 9 in figs.1 & 3); wherein said initial reflector (5) consists of at least a mirror (fig.1, "5:..."); wherein said final reflector (6) consists of at least a mirror (fig.1, "6:..."); further comprising an image projection apparatus (pg.2, 1st column, lines 1-7) disposed proximate to said output direction (7,15) to collect substantially said useful polarization (9,13,14); said image projection apparatus consisting of a transmissive LCD (pg.2, 1st column, lines 1-7); in regards to claims 38 and 39, given the structure of the polarization recovery apparatus and the illustration of the polarization of light transmitted and reflected in at least figures of IMAI et al, the method of polarization recovery and the means for polarizing, transmitting and reflecting of claims 38 and 39, respectively, are disclosed by IMAI.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 7-11, 21, 22, 31-33 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over IMAI et al (JP 63197913 A) in view of LEVIS et al (US 5,884,991).

13. IMAI discloses the claimed invention including as best illustrated in fig.1, a shape of the polarizing beam splitter (4) being matched substantially to an aperture of the source (1) of electromagnetic radiation (3). However, IMAI does not disclose: an input light pipe having an input surface and an output surface, transmitting the un-polarized light at the output surface to the polarizing beam splitter of claim 7; the claimed shape of the input and output surfaces consisting of flat, convex, concave, toroidal and spherical of claims 8 & 9; the material of the input light pipe of claim 10; the input light pipe being selected from the group consisting of a SLP and TLP of claim 11; a shell reflector having first and second focal points, the source of electro-magnetic radiation disposed proximate to the first focal point and the input surface disposed proximate to the second focal point of claim 21; and the shell reflector comprising at least a portion of a shape selected from the group consisting of a substantially elliptical surface, spherical surface and toric surface of claim 22; the source of electro-magnetic radiation comprising an arc lamp, a halogen lamp or a filament lamp as claimed in claims 31-33.

14. In regards to claims 7-11, LEVIS teaches an input light pipe (3 in fig.2, or 50 in fig.8) having an input surface (23, col.6, line 17) and an output surface (105 in fig.3, or 51 in fig.8), the output surface disposed proximate in an input face (105 in fig.3, or 51 in fig.8) of the polarizing beam splitter (5A), the input light pipe (3, 50) receiving substantially un-polarized light at the input surface (23) and transmitting the unpolarized light at the output surface (51) to the polarizing beam splitter (5A), including the shapes of the input surface being any of flat, convex or hemispherical, concave (cone-shaped) (col.6, lines 12-20) and of the output surface (105 or 51) being at least flat (col.7, line 29), the material of the input light pipe being any one of glass and plastic (col.6, lines 4-5), and the input light pipe being at least tapered in shape (col.6, lines 22-34) for the purposes of producing a homogenized uniform color temperature of white light, reducing the amount of light lost in spillage, provide light uniformity at least over the input face of the polarizing beam splitter and reducing the angle population of the outgoing beam cone (col.4, lines 32-61). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the polarization converting optics used with liquid crystal display of IMAI et al to include the type of input light pipe as taught by LEVIS et al in order to improve color uniformity, light uniformity, collection efficiency and reduce population angle of the outgoing beam cone resulting in reduction in physical length of the light engine.

15. In regards to claims 21, 22, 31-33 and 36, LEVIS further teaches a concave reflector (106, fig.3) having first (F1,F2) and second (F1',F2') focal points (col.8, lines 35-38), a lamp bulb.(107) being any one of a plasma arc bulb, a xenon arc lamp, an

incandescent or halogen bulb (col.8, lines 27-31) disposed proximate to the first focal point (F_1, F_2 , fig.3), the input surface (101) of the light pipe (103 or LPI) disposed proximate to the second focal point (F_1', F_2'), and the concave reflector (106) comprises a substantially elliptical surface of revolution (col.8, lines 6-8) for the purpose of reducing image size for low angle collected light and reducing cone angle of the collected light, maximizing light transfer between the collector (reflector and light source) and the light pipe entrance pupil. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the polarization converting optics used with liquid crystal display of IMAI et al to include the type of light source with definite arc or filament length and concave reflector as taught by LEVIS et al in order to maximize light collection and transfer to the input light pipe, contributing to the high collection efficiency directed to the polarization optics and LCD.

16. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over IMAI et al (JP 63197913 A) in view of PERKINS et al (US 6,288,840).

17. IMAI discloses the claimed invention except a wire-grid polarizing beam splitter.

18. PERKINS teaches a wire-grid polarizing beam splitter (100, fig.10) for the purpose of reflecting S-polarized light (65) and transmitting P polarized light (67) from a beam of light (63) while possessing a wider angular aperture and improve performance in the corners of the aperture where the rays in a cone of light incident on the polarizing interface (61) in the middle of the cube are with compound angles over a MacNeille prism (col.9, lines 2-15).

19. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the polarization converting optics of IMAI et al to include the type of wire-grid polarizing beam-splitter as taught by PERKINS et al in order to separate S and P polarized light components from an incident light beam of wide angular aperture and compound angles, so as to efficiently use substantially all light to be polarized.

Allowable Subject Matter

20. Claims 2-6, 12-16, 18, 20 and 23-30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

21. The following is a statement of reasons for the indication of allowable subject matter: None of the prior art of record suggests at least: (a) a first output reflector disposed reflectably to the output direction and reflecting the useful polarization light in the second orthogonal direction (substantially orthogonal to the output direction and the first orthogonal direction) and a second output reflector disposed reflectably to the second orthogonal direction reflecting the useful polarization light in the output direction (claims 2-6); (b) an output light pipe having an input surface disposed proximate to the output direction and an output surface, the output light pipe receiving the useful polarization light at the input surface and transmitting the useful polarization light at the output surface (claims 12-16); (c) the initial reflector and the final reflector each having a coating that transmits a pre-determined portion of the electromagnetic spectrum

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selected from the group consisting of infrared light, visible light, a pre-determined band of wavelengths of light, a specific color of light, and combination thereof (claims 18 and 20); the shell reflector comprises a secondary reflector having a second optical axis place substantially symmetrically to the primary reflector, wherein the rays of light reflect from the primary reflector toward the secondary reflector (claims 23-27); a retro-reflector disposed on a side of the source opposite the shell reflector (claims 28-30).


Conclusion

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. KUREMATSU et al (JP 04088301 A) show in fig.2 an apparatus that equalizes the polarization light P from light rays initially beam splitted into P and S light rays and then reflected in orthogonal directions and directed to an output direction (2,3). Note in KUREMATSU, what may be considered the final reflector (6) disposed reflectably to the second orthogonal direction (aligned with any vertical axis) reflects non-useful polarization light (S) in an output direction (6a) parallel and similar to the output direction of useful polarization light (P) reflected by first and second output reflectors (9a,9b), but opposite to the output direction of the useful polarization light (P) transmitted by beam-splitter (4). YOKOYAMA et al (US 6,081,367) show an output terminal (11, fig.1) or output optical fiber (30b, fig.3) receiving light of combined polarization.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Cariaso whose telephone number is (571) 272-2366. The examiner can normally be reached on 9-5:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (571) 272-2378. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alan Cariaso
Primary Examiner
Art Unit 2875

AC
February 18, 2005